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The Canadian Phytopathological Society

Fourteenth Session

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LETHBRIDGE

Alta.

Editorial Committee

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R. C. RUSSELL
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The Canadian Phytopathological Society

LIST OF OFFICERS AND COUNCIL
1946—1947

President

THORVALDUR JOHNSON, Dominion Laboratory of Plant Pathology, Winnipeg, Man.

Vice-President

R. R. HURST, Dominion Laboratory of Plant Pathology, Charlottetown, P.E.I.

Secretary-Treasurer

R. C. RUSSELL, Dominion Laboratory of Plant Pathology, Saskatoon, Sask.

Councillors

L. W. KOCH, Dominion Laboratory of Plant Pathology, Harrow, Ont.

J. D. MacLACHLAN, Ontario Agricultural College, Guelph, Ont.

INVITATION PAPER

The invitation paper for the Lethbridge meeting of the Society was given by one of the society's leading members, Dr. W. F. Hanna. As one of the three Canadian scientists invited to attend the Indian Science Congress in Delhi in January 1947, Dr. Hanna had an excellent opportunity to visit a number of Indian Universities and Research Institutes and to become acquainted with the problems confronting India, particularly in relation to agriculture. His observations on plant pathological and plant breeding programs of the country were of particular interest to the members as well as to a number of visitors from the A.I.C. convention. An abstract of this paper is given in these proceedings.

MINUTES OF THE FOURTEENTH ANNUAL MEETING HELD AT LETHBRIDGE, ALBERTA JUNE 23 to 26, 1947

Business Session: June 23, 9:00 a.m.

Dr. Thorvaldur Johnson occupied the chair, and twenty-one members were present. The President opened the meeting with a few appropriate remarks and then announced the appointment of two committees to serve during the convention. These were as follows: Publicity Committee — M. W. Cormack, F. J. Greaney, and R. E. Fitzpatrick; and Resolutions Committee — A. W. Henry, B. J. Sallans, and L. T. Richardson.

Since the minutes of last year's meeting had already been published and distributed to all the members, it was moved by T. Johnson and seconded by W. J. Cherewick that the minutes be adopted without being read. This motion carried.

The Secretary-treasurer read his report and financial statement, and these were adopted on a motion by R. C. Russell and W. F. Hanna.

Applications for membership were received from Elizabeth E. Badger, Donald C. Buckland, Lorne C. Callbeck, Thomas R. Davidson, Raymond E. Foster, John Gilpatrick, Keith M. Graham, Robt. J. Hastings, E. L. Lopatecki, Blair H. MacNeill, Iain C. MacSwan, A. W. McCallum, Colin D. McKeen, Wilbert E. McKeen, Mildred K. Nobles, Vidar J. Nordin, Lloyd T. Richardson, Philip J. Salisbury, R. Arthur Waldie, Maurice F. Welsh, and Norman S. Wright. It was moved by R. C. Russell and seconded by G. H. Berkeley that they be officially admitted into the society. Carried.

In the absence of L. W. Koch, the Secretary read the report of the Nominating Committee. This was adopted on a motion by T. C. Vanterpool and R. C. Russell.

T. Johnson read his report as Custodian and moved its adoption. This was seconded by L. E. Tyner. Carried. Arising out of the discussion of this report, it was suggested that members be asked to turn in copies of certain old proceedings if they were needed to meet requests from libraries and other institutions.

A committee, consisting of the retiring Secretary, the in-coming Secretary, and W. J. Cherewick, was appointed to count the ballots for the position of Vice-president.

The President then read G. A. Ledingham's report on the proposed formation of a Canadian Microbiological Society.

After considerable discussion, it was moved by T. Johnson and seconded by W. F. Hanna that Dr. Ledingham's report be received and that he be thanked for the preparation of same. Carried.

Also it was moved by W. F. Hanna and seconded by T. C. Vanterpool that we place ourselves on record as favoring a Canadian Microbiological Council and that we arrange to send a delegate, possibly G. A. Ledingham, to the convention in Toronto next fall. Moreover, that we envision the possibility of expanding such a council to a Canadian Biological Council and, finally, the formation of a Canadian Society for the Advancement of Science. Carried.

The matter of affiliation with the Agricultural Institute of Canada came up for discussion. The Secretary pointed out that the great majority of those voting by mail on the question favored retaining affiliation with the A.I.C. but that only about 50 per cent of our members were also members of the larger body, and their constitution requires that at least 75 per cent of a society's membership should belong also to the A.I.C. before affiliation is granted.

After much discussion, it was moved by W. F. Hanna and seconded by G. H. Berkeley that we notify the A.I.C. that our society wishes to retain its affiliation with the A.I.C. and that we are prepared to make a systematic effort to get more of our members, who are engaged in agricultural research, to join the A.I.C., but

that we cannot guarantee to raise the number to 75 per cent of our membership because some of our members are United States workers and some are engaged in forest pathology and other research not directly connected with agriculture. Carried unanimously.

The President was then appointed to explain our position to the Agricultural Institute of Canada at their business session on Thursday.

The remainder of the forenoon was devoted to the presentation of scientific papers.

Business Session: June 25, 4:00 p.m.

The President occupied the chair, and about fifteen members were in attendance.

The Secretary reported the election of A. W. Henry to the position of Vice-president.

M. W. Cormack reported for the Publicity Committee that brief reports were being handed to the press representative after each of our sessions. On a motion by M. W. Cormack and R. E. Fitzpatrick, this report was approved by the meeting.

A. W. Henry reported that appropriate resolutions were being prepared and that these would be turned in to the new secretary. This report was adopted on a motion by A. W. Henry and B. J. Sallans.

It was moved by T. Johnson and seconded by T. C. Vanterpool that the following members serve on the editorial committee for the coming year: B. J. Sallans, R. C. Russell, and D. B. O. Savile. Carried.

It was moved by R. E. Fitzpatrick and seconded by R. C. Russell that the regional representatives at all points, except Fredericton, N.B., be asked to serve again for the coming year or secure a substitute for their region, and that D. J. MacLeod be appointed as our regional representative for New Brunswick. Carried.

A hearty vote of thanks to the retiring executive was moved by R. E. Fitzpatrick and seconded by M. W. Cormack.

In replying, the retiring President expressed appreciation for the efforts of the retiring Secretary-treasurer and then handed the meeting over to the new President, R. R. Hurst.

The new President spoke briefly, expressing the hope that continued progress would be made by the Society during the coming year; and the meeting was then adjourned.

RESOLUTIONS

Be it resolved

1. That we express our sincere thanks to our hosts, the South Alberta Branch of the A.I.C., for the outstanding hospitality extended to us on the occasion of the 27th annual convention of the A.I.C. held in Lethbridge, Alberta, from June 23-26, 1947.
2. That we tender to the A.I.C. our gratitude for the excellent facilities arranged at the Lethbridge Convention, June 23-26, 1947, for holding our annual meeting.
3. That we convey to Dr. W. F. Hanna our appreciation for the excellent invitation paper entitled "Science in India" which he delivered to our annual meeting in Lethbridge on June 25, 1947.
4. That we express our gratitude to Dr. J. R. Booer, Tilgate Horticultural Experimental Station, Crawley, Sussex, England, for attending our annual meeting at Lethbridge and for presenting a most interesting and informative paper on Seed Treatment Problems. *

* This paper has been printed under the title, "Some Problems of Seed Disinfection", and copies were sent to all members of the C.P.S. with the compliments of the Manufacturers and Distributors of Leytosan.

REPORT OF THE NOMINATING COMMITTEE OF 1947

The committee chairman, L. W. Koch, circularized members of the nominating committee in April concerning possible nominees for office on the council during the forthcoming year, keeping in mind the "guiding rules" suggested by the committee of the previous year. The slate of officers first agreed upon was subsequently altered due to the fact that Dr. R. C. Russell did not wish to accept re-nomination as Secretary.

Your committee submits the following slate of officers for the year 1947-48:

President ..... R. R. Hurst
Vice-President ..... P. M. Simmonds
A. W. Henry
Secretary-Treasurer ..... L. T. Richardson
Councillor ..... J. E. Jacques

Respectfully submitted by the Nominating Committee.

F. L. DRAYTON
J. E. JACQUES
P. M. SIMMONDS
T. C. VANTERPOOL
L. W. KOCH *(Chairman)*

REPORT OF THE EDITORIAL COMMITTEE

At the Thirteenth Annual Meeting of the Canadian Phytopathological Society, held at Macdonald College in June, 1946, twelve papers were presented. One of these was an invitation paper by Dr. Rene Pomerleau on the Dutch elm disease in Canada. Abstracts of all papers read at the Annual Meeting were published in the Fourteenth Annual Proceedings of the Society. Thanks to the cooperation of contributing members, most of the abstracts were in the Secretary's hands shortly after the meeting, so that the proceedings were ready for publication by mid-December. The editorial committee is extremely grateful for the prompt submission of articles and trusts that the principle of preparing abstracts before the time of presentation of papers will be continued so that early publication of the proceedings will be facilitated.

On the recommendation of the meeting the list of papers published by Society member during the 1944-45 and 1945-46 Society years were included in the proceedings. The committee wishes to express its appreciation of the cooperation of members in the compiling of the lists and again recommends that the information on this point for the coming year be assembled as soon as possible after the annual meeting.

The Fourteenth Proceedings were published in Saskatoon at the Society's expense, one hundred and fifty copies being printed. The committee wishes to thank the Secretary-treasurer, Dr. R. C. Russell, for his efficient handling of the task of publication and distribution.

R. S. WILLISON, *Chairman.*
THORVALDUR JOHNSON
B. J. SALLANS

REPORT OF THE CUSTODIAN OF THE LIBRARY AND RECORDS OF THE SOCIETY

During the past year, 28 bulletins and reprints of published papers have been added to the library and indexed as received.

Several requests were received for complete sets of our Proceedings on an exchange basis. On this understanding, complete sets of our Proceedings were furnished to the Nova Scotian Institute of Science, the Agricultural Institute of Oka, Quebec, the library of the Royal Veterinary and Agricultural High School, Copenhagen, Denmark, and the library of the Royal College of Agriculture, Uppsala, Sweden.

A request from the Imperial Bureau of Plant Genetics for a donation of a set of our Proceedings was also filled, as was a similar request from the library of the Department of Agriculture and Commerce of the Philippine Islands, which was destroyed during the Japanese invasion.

As only seven complete sets of the Proceedings remain on hand, it is recommended that future disbursements be limited to five of these and that the two remaining sets be kept in the library.

T. JOHNSON

REPORT OF A COMMITTEE ON THE QUESTION OF ORGANIZATION OF CANADIAN MICROBIOLOGY

Last June at Macdonald College, members of the Canadian Phytopathological Society discussed the advisability of attempting to organize a Society of general microbiology in Canada. Since it was impossible to deal with the subject in detail at the time, the writer was delegated to select a committee to discuss the question and report back to the society before the next annual meeting.

After preliminary discussions had been held with a number of bacteriologists, plant pathologists, and mycologists in Toronto and McGill University and various laboratories in Ottawa, the following committee was called together for a meeting in the National Research Council on December 12, 1946:

Dr. A. C. Mitchell representing Veterinarians
Dr. C. K. Johns representing Dairy Bacteriology
Dr. A. G. Lochhead representing Agricultural Microbiology
Mr. T. Gibbard representing Public Health Bacteriology
Dr. F. L. Drayton representing Mycology and Plant Pathology
Dr. N. E. Gibbons representing Food Microbiology
Dr. G. A. Ledingham representing Industrial Microbiology

Although the committee was confined to men from Ottawa laboratories the interests of the group covered nearly the whole field of microbiology. It was possible to review several of the existing organizations which serve specialized fields of microbiology and also to hear of previous efforts to organize a Canadian Society. Dr. C. K. Johns had, before the war, carried on correspondence with Dr. Murray of McGill University regarding organization of Canadian Bacteriologists. Dr. Murray was, and still is, very much in favour of forming a general society of microbiology but has had great difficulty in obtaining wide support for his plan. The reasons are obvious when the present set-up is examined. As Dr. Mitchell reported to the meetings, the veterinarians are well organized in their own professional society and he questioned whether many of them could or would care to join another organization. The same holds true for public health and medical bacteriologists. They have their professional society which holds annual meetings and publishes a journal.

In contrast with the veterinarians and public health and medical bacteriologists, agricultural workers in microbiology are poorly organized. Apart from the plant pathologists there is no national organization for workers in agricultural bacteriology and mycology. The same holds true for those in food and industrial microbiology. During the war both these fields expanded and many companies now have bacteriologists or chemists interested in micro-organisms on their staffs. In addition to these, there are a number of bacteriologists and algologists in the fisheries stations, who have no society of their own.

At the meeting on December 12th several different possibilities were discussed. It appeared very doubtful whether a distinct Canadian Society of Microbiology could hope to succeed if formed at the present time. The agricultural groups could not hope to organize such a society and attract into it sufficient numbers of the Canadian Public Health Association so that the society could be really national and cover the whole field of microbiology. Similarly it is questionable whether the laboratory section of the Public Health Association would be any more successful if it was expanded to include agricultural and industrial workers. It was therefore suggested that perhaps a Dominion Council of Microbiology might be appointed by the different organizations or societies already in existence. This body could take care of International questions such as Congresses and might be used to integrate meetings or programs of the different bodies.

Since the Public Health meetings were being held in Montreal the week before Christmas, Dr. Mitchell and Mr. Gibbard agreed to raise the question of forming a Canadian Society of Microbiology there, and also to present the alternative of having a Dominion Council appointed by the various groups belonging to different societies. The response was as had been anticipated. Most members would like to have some method of integrating the various fields of microbiology but were not keen on being members of an outside society as well as their professional body. Dr. Mitchell reported to me that they favoured setting up a Dominion Council to which the different societies each appointed one or two members. They also urged the agricultural workers to organize a society, possibly affiliated with an agricultural organization such as the A.I.C. Dr. Mitchell also suggested that it might be possible to organize the industrial and food microbiologists with one of the industrial organizations. The workers in industry are, however, a much smaller group than those in agricultural microbiology and as most of them have an interest in the agricultural field it is possible that one society would be adequate for the present.

In view of the discussions which have been held so far your committee strongly recommend that agricultural workers in microbiology form a society which might be affiliated with the A.I.C. This would probably be preferable to making it a subject group since some members may not wish to join the A.I.C. If the new society could be formed at the Lethbridge meetings in June, steps could then be taken later in the year to set up a Dominion Council for the purpose of handling International questions. The present organization of the Canadian Committee for the International Congress of Microbiology is most unsatisfactory. It is composed almost entirely of medical men and many fields of microbiology are not represented at all.

A letter has just been received from Dr. Mitchell pointing out that the Canadian Public Health Association meetings will be held in Toronto on December 15th and 16th, 1947. Dr. Mitchell has suggested to the Secretary that he reserve one extra convention room subject to cancellation in the fall, for the use of a delegation from the Agricultural Microbiologists. If the agricultural group could send a delegation to this meeting it would be possible then to make a start on future plans for microbiology in Canada. At least it would be possible to discuss the necessity for a Dominion Council or a General Society.

The question of a joint meeting in December should be discussed at the Lethbridge convention and certain delegates appointed.

As to the future of the C.P.S. this committee hesitates to make any recommendation. We have pointed out the desirability of having an Agricultural Microbiology Society to include all those interested in this field. Plant pathology is one important phase of the work and might well take the lead in organizing the new society.

G. A. LEDINGHAM.

REPORT OF THE SECRETARY-TREASURER

Mr. President and Fellow Members:

I have the honour to present the following report covering my work for the Society during the past year.

Our proceedings for the year 1945-46 were published and sent out to all members in February of this year, so I need not touch on matters dealt with in that publication other than to say that the annual meeting, held at Ste. Anne de Bellevue a year ago, was fairly well attended and that the invitation paper on the Dutch Elm Disease in Canada, presented by Dr. Pomerleau, was very interesting and informative. Also a list of the papers published by our members between June 1st, 1944 and May 31st, 1946, was compiled and incorporated in the proceedings. This entailed a great deal of work, and I am grateful to the regional representatives and others who helped build up this list.

A campaign for new members during the year resulted in a very gratifying increase in our numbers. The regional representatives, particularly Walter Jones of Saanichton, are very largely responsible for an increase from seventy-eight regular members at the beginning of the fiscal year to one hundred and ten at its close. It is hoped that the increased interest in our Society and its activities will be maintained and developed further this coming year.

The main problem facing our Society at the present time, apart from increasing its usefulness to its members, is deciding upon our relationship with the Agricultural Institute of Canada for the immediate future. The ballot conducted last autumn showed that, of the 61 who replied, 42 of our members were in favour of retaining our affiliation with the A.I.C., 10 were in favour of affiliation with certain reservations, 3 favoured changing to an independent society, and 6 expressed themselves as favouring the idea of becoming a subject group of the A.I.C. Now the difficulty is that only about 50 per cent of our members also belong to the A.I.C., and that they require that 75 per cent of a society's members should belong to the larger organization before affiliation is granted. I wrote to the Secretary of the A.I.C. and asked him if there was any chance of the percentage being lowered so as to permit us to remain an affiliated society, but he was unable to determine the matter at the time. It is the duty of this meeting to decide on a course of action under the present circumstances and when the matter comes up I will read various suggestions from our members as to what might be done.

As was the case last year, we had two persons suggested for the position of Vice-president; namely, Dr. A. W. Henry and Dr. P. M. Simmonds. As a result of the voting by mail Dr. Henry has been elected to fill the post for the coming year.

FINANCES

As the attached financial statement shows, doubling our annual fee has enabled us to build up a favorable balance at the close of the fiscal year in spite of considerably higher costs in the publication of our proceedings. Our credit balance is now $81.06 compared with $19.88 a year ago. As I prophesied last year, a fee of $1.50 would have enabled us to break even, but it is well to have the extra reserve. We still hold a five hundred dollar Victory Bond drawing three per cent interest. Membership dues came in well during the year, but we have to drop two from our membership for non-payment of fees.

This report is respectfully submitted by your retiring Secretary-treasurer.

R. C. RUSSELL.

FINANCIAL STATEMENT
CANADIAN PHYTOPATHOLOGICAL SOCIETY
June 1st, 1946 to May 31st 1947

Revenue:

Balance brought forward			$ 19.88
Fees:			
1945-56	$ 4.00		
1946-47 balances	4.00		
1946-47	208.00		
		$216.00	
Interest on bond		15.00	
Sale of Proceedings		2.50	
		$233.50	- 253.38

Expenditure:

Honorarium to Miss S. M. Anderson	15.00	
Printing of Proceedings No. 14	134.56	
Mimeographing circular letter	.98	
Bank exchange on cheques	.75	
Ballot envelopes	.35	
Bank fee on cheques	.18	
Stamps, etc.	20.50	
	$172.32	
Balance (on hand) May 31st, 1947		$ 81.06

Additional Asset:

Dominion of Canada 3% Victory Bond (Series K8Z32643)	500.00

Audited and found correct,

(Signed) B. J. SALLANS
P. M. SIMMONDS

June 18, 1947.

ABSTRACTS OF PAPERS PRESENTED AT THE FOURTEENTH ANNUAL MEETING OF THE CANADIAN PHYTOPATHOLOGICAL SOCIETY

SCIENCE IN INDIA

W. F. HANNA, Dominion Laboratory of Plant Pathology, Winnipeg, Man.

India now stands at the threshold of a new political era. Events in the next few years will probably decide if that great sub-continent is to remain divided or if it will emerge as a united nation; whether it will elect independence or remain within the British Commonwealth. Overshadowing the current political negotiations — important though they are — is the ever-present problem of providing an adequate diet for the Indian people. This problem will confront any future government or governments of India.

The present population of India, some 400 millions, is increasing at the rate of about 5 millions each year. The Indian people make up almost 1/5 of the world's population. The mean density of population in British India is more than 600 per square mile of cultivated land. The average daily diet of the Indian is about 960 calories, just a little above the starvation level of 800 calories. It is difficult for Canadians, living in a country with a population of only about 22 per square mile of cultivable land, to appreciate the situation that exists in India today.

The area of land devoted to crops in India each year is about 300 million acres, which is not far short of the 350 million acres classified as potential agricultural land in the whole of Canada. Crop yields are low due to lack of seasonal rainfall, the growing of unimproved varieties, poor farming methods, plant diseases, depleted soil fertility, and the cultivation of small and scattered holdings. The average yield of wheat on some 34 million acres is only about 10 bushels per acre.

Science occupies an important place in the cultural and economic life of India and is destined to play a decisive role in the future development of the country. The Indian Science Congress, which held its 34th session at Delhi last January, is representative of all branches of science in India and, in this respect, is comparable to the American and British Associations for the Advancement of Science. Organized at Calcutta in 1914 through the initiative of two British chemists, P. S. MacMahon and J. L. Simonsen, the Congress has grown from an initial membership of about 105 to its present membership of more than 1000 and has expanded from its original 5 sections to 13. It is a matter of some interest that India, which is only now attaining commonwealth status and is still far from becoming a united nation, has for 34 years possessed a national organization fully representative of all branches of science, whereas Canada, which has for years enjoyed commonwealth status, has as yet no comparable scientific body. In view of Canada's national and international interests in scientific research it is suggested that the time is opportune for Canadians to organize an association for the advancement of science.

India has the scientific manpower and the natural resources required for the improvement and expansion of her agriculture and industry. Many of her scientists have won international recognition and their brilliant achievements suggest that the people of India are not lacking in scientific talent and aptitude. India has vast deposits of coal and iron, the two key materials essential for industrial development. Her coal resources have been estimated at 65 billion tons and her iron ore resources as sufficient for a 1000 years.

The recent war brought about a notable expansion of industrial production in India and, coincident with it, an increase in scientific research and technology. The Provisional Government of India has given strong support to research in agriculture and industry. As a result of that policy hundreds of young scientists have been sent abroad for training and modern laboratories are being constructed and equipped, such as the National Physical Laboratory, National Chemical Laboratory, National Metallurgical Laboratory, Fuel Research Institute, and the Central Glass and Ceramics Research Institute.

It is expected that an expansion of industry in India will have the two-fold effect of increasing consumer goods and removing pressure from the land. At present 74 per cent of the Indian people depend directly on agriculture for a livelihood as compared with 26 per cent in the United States and 40 per cent in France.

India cannot reduce the pressure of population by emigration, as was done in Europe 75 or 100 years ago. Neither would it be possible to import foodstuffs in quantities sufficient to meet the needs of the Indian people, although supplies from surplus-producing countries would bring some relief. The importation of 120 million bushels of Canadian wheat each year would only raise the average daily diet to a little over 1000 calories. In the application of science to agriculture lies India's greatest hope for an increase in food production. It has been estimated that production from the area now under cultivation could be increased by approximately ⅓ through the growing of improved varieties and the adoption of modern farming practices. Food supplies might be further augmented by the extension of irrigation and by the cultivation of an additional 150 million acres classified as agricultural land.

In increasing India's food resources plant pathologists are playing an important part. It has been estimated that the cereal rusts cause an annual reduction of about 6 per cent in the yield from some 60 million acres of wheat and barley. The three cereal rusts found in Western Canada — back stem rust, leaf rust, and stripe rust — occur also in India. The epidemiology of these rusts has been thoroughly studied and it has been found that because of the intense summer heat on the plains, where the bulk of the cereal crop is grown, rust spores are unable to survive there and infect the next crop. Oversummering of spores takes place on cereals growing on relatively small areas in the hills and from there the spores are disseminated by wind to the plains where they initiate infections on the fall-sown crop.

The situation in India, where rust spores are unable to survive the intense summer heat of the plains but remain viable at higher altitudes, provides an interesting contrast with the sequence of events in Western Canada where rust spores are unable to survive the cold of winter but remain viable in the lower latitudes of the Southern United States and Mexico whence they spread northward in the spring. Plant breeders and plant pathologists in India are cooperating in producing varieties of cereals resistant to rust. Until suitable varieties become available, efforts have been made to control rust in the plains by discontinuing the growing of wheat and barley in the hills, thus preventing the oversummering of spores. These efforts have not met with marked success.

The high summer temperatures of the plains regions of India which, in the Punjab, sometimes reach 120°F. in the shade and as high as 133°F. as recorded by the black bulb thermometer, have proved to be useful in controlling loose smut of wheat as well as in destroying rust spores. By pre-soaking the grain and then spreading it out in the sun to dry it has been found that loose smut infection can be eliminated.

India, confronted as she is today with the two-fold problem of population and food supply, may well prove to be a testing ground for ideas of international cooperation in the production and distribution of foodstuffs. Many people take the view that the limit of population has already been reached in India, if not exceeded. The same is true of certain other countries as well. Certainly there is a definite limit to the number of people for whom the world can provide food. What that limit will prove to be will depend on the efficiency of our methods of production, our system of distribution, and the standard of living we demand. It has been estimated that an additional 1,000,000,000 acres of tropical land and 300,000,000 acres of extra-tropical land are suitable for food production, and that if these great areas were placed under cultivation the total food resources of the world would be sufficient to support a population of some 6,500,000,000. When viewed in this perspective the task of feeding India's millions and the other needy peoples of the world becomes more hopeful. The natural resources are available; the question is whether or not we choose to develop them for the good of mankind through the application of scientific principles. This is the great challenge that presents itself to agricultural scientists today. It is a task which will call for energy, vision, and international cooperation of the highest order.

INTERVARIETAL CROSSING IN PUCCINIA GRAMINIS PERS.

T. JOHNSON, Dominion Laboratory of Plant Pathology, Winnipeg, Man.

Crosses have been made, in nearly all possible combinations, between varieties *Tritici, Avenae, Secalis, Agrostidis,* and *Poae.* The degree of fertility was found to vary considerably, depending on which varieties were crossed. Relatively high in fertility were the crosses *Tritici-Secalis, Agrostidis-Poae,* and *Avenae-Agrostidis.* Much lower in fertility were the crosses *Avenae-Tritici* and *Avenae-Secalis.* In crosses between varieties *Tritici* and *Agrostidis* the degree of fertility varied according to the direction of the crosses: *Tritici* x *Agrostidis* crosses succeeded fairly well but the reciprocal crosses failed to produce aecia.

Generally, the hybrid rusts had a wider range of pathogenicity than either of the parental varieties but this widening of host range occurred at the expense of pathogenic vigour, the hybrids tending to be pathogenically rather weak on any given host. The work suggests that there are two factors that tend to prevent the appearance in nature of new stem rust strains of hybrid origin: one is intersterility, the order is the fact that most hybrids are so constituted pathogenically that they do not readily find a highly susceptible host.

DETERMINATION OF SMUT SPORE LOAD ON CEREAL SEED GRAIN

W. J. CHEREWICK, Dominion Laboratory of Plant Pathology, Winnipeg, Man.

The method of smut spore load determination described previously was found to be quite reliable for ordinary seed testing purposes, particularly with wheat seed. Wash water containing 0.05 per cent Aerosol OT washed off over 90 per cent of smut spores. Five separate washings each of several 10-pound samples of wheat bearing light to moderate spore load gave very close readings; for example, A — 1, 2, 1, 1, 1; B — 16, 16, 16, 14, 16; C — 44, 48, 51, 46, 51; D — 1060, 1020, 1080, 1040, 1064. With heavier spore loads, however, the readings varied widely, probably due to variation in number of partially smutted kernels in different wash-samples.

A RAPID METHOD OF EXAMINING WHEAT HEADS FOR BUNT INFECTION

W. POPP, Dominion Laboratory of Plant Pathology, Winnipeg, Man.

To facilitate the detection of bunt of wheat *(Tilletia foetida* and *T. caries)* a method has been devised by means of which bunted heads can be detected by visual inspection and by means of which as many as 2,500 heads of wheat can be examined by one person in an hour. The grain to be examined is harvested when the majority of the heads are ripe. Immediately prior to examination, the heads are soaked in water. Soaking may be done in either of two ways: (1) by immersing the heads in water at or near the boiling point and leaving them to soak overnight; (2) by immersing the heads for about 24 hours in water (at about room temperature) containing a wetting agent (Aerosol OT). The inspection for bunt is carried out in a good light while the heads are still wet. In a total of 68,000 heads of wheat examined for bunt infection by visual inspection, 10,147 (14.9 per cent) were classified as infected when examined in the dry condition, whereas 12.558 (18.5 per cent) infected heads were found to be present when examined after soaking in water. In one wheat variety necessitating the examination of 3,400 heads, bunt infection could be detected in only 34 (1.0 per cent) when the heads, but not the individual spikelets, were examined in the dry condition. After soaking in water, 100, (2.9 per cent) of the 3,400 heads were found to be infected.

RELATIVE PATHOGENICITY OF SINGLE AND MIXED STRAINS OF OPHIOBOLUS GRAMINIS SACC.

A. W. HENRY and J. D. GILPATRICK, University of Alberta, Edmonton, Alta.

Virulent strains of *Ophiobolus graminis,* the cause of take-all of wheat, were not appreciably reduced in pathogenicity in the greenhouse experiments reported, as a result of association in mixed inocula with less virulent strains. Different amounts of inoculum of a non-pathogenic added to that of the pathogenic strain

appeared to have a diluting effect and to induce no detectable alteration of pathogenicity. The results suggest that mixtures of strains of *Ophiobolus graminis* might be advantageously used in testing the relative susceptibility of host species and varieties.

ERGOT OF CEREALS AND GRASSES

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Inoculations with pure cultures of *Claviceps purpurea* show that in Manitoba a single strain attacks rye, barley, wheat, oats, *Bromus inermis, Agropyron* spp., *Elymus* spp., *Poa pratensis* and *Phleum pratense*. Another strain was collected on wild rice, *Zizania aquatica;* this strain cannot attack cereals and other grasses, and its sclerotia float on water unlike those of the other strain.

On potato-dextrose agar both strains produced dense, white, rarely light purple, mycelium but few conidia. Addition of barley-malt meal to the medium increased conidium production, but sclerotia have not been formed in pure culture. Cultures from single ascospores infected rye and produced viable sclerotia. Sclerotia, stratified in moist sand and stored for two months at 5°C., grew normally after a month at room temperature.

Experiments from 1942 to 1945 showed that the amount of ergot depended upon the numbers of sclerotia in adjacent unploughed rye stubble, strips of which were interspersed with strips of fall and spring rye. Harvesting of the unploughed strips was usually delayed until the rye was over-ripe, to permit maximum shedding of sclerotia. Infection was light in 1942, but in 1943 and 1944 both fall and spring rye were heavily infected. In 1944 ergot was recovered from fall rye at 175-200 lb. and from spring rye at 75-100 lb. per acre. Ergot production seemed to be influenced by thickness of stand and time of flowering. The stand of fall rye was much thicker than that of spring rye; and fall rye flowered in June coincident with heavy ascospore showers, whereas spring rye flowered in July during light showers. Spore traps in the rye showed that spore showers reached their peak late in June.

All strips were ploughed after the 1944 harvest. On the same land two strips of fall and two of spring rye, interspersed with fallow strips were sown. Seed containing much viable ergot was sown three inches deep. Although the season favoured sclerotium germination, few ascospores were caught and neither crop was noticeably infected. No ergot fruit bodies could be found on the ground. Digging some rows of rye showed that sclerotia had germinated well, but that the stalks had failed to reach the surface. Experiments in other years yielded similar results.

STUDIES ON THE HOT WATER METHOD OF TREATING SEED BARLEY FOR THE CONTROL OF TRUE LOOSE SMUT, USTILAGO NUDA

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Previous work by various investigators on the hot water treatment was referred to briefly. The main reason for the present studies was the fact that the commonly published schedules for the treatment of barley had been found to cause severe injury. In eight tests with different seed samples, the reduction in emergence was 32 per cent when the standard schedule was used and 92 per cent when a recently recommended schedule was employed.

These studies are still in progress, but the schedule in use at present is as follows: the seed is presoaked for five hours in water at approximately 72°F., placed directly into a hot water bath at 125° to 126°F. for eleven minutes, cooled quickly in water and drained, and finally dried for five days before sowing. The above schedule was used in several tests conducted, both in the greenhouse and in the field, and good control of true loose smut was secured with comparatively minor reductions in yield.

Cooperative tests on a larger scale were conducted by the author and Mr. Howard Gerrie of the Field Husbandry Department, University of Saskatchewan. Very good results were obtained by using wire baskets designed by Mr. Gerrie. These baskets hold about 1½ bushels of seed and are pumped up and down in the hot water to ensure uniform heating of the seed.

It is recommended that this treatment be used to a greater extent at experimental farms and agricultural colleges, to ensure that special seed stocks being increased for the use of farmers may be kept free of the disease. In special cases, it may be feasible to treat reasonably large quantities of seed at local creameries.

EFFECT OF FORMALIN SEED TREATMENT ON ROOT DEVELOPMENT OF WHEAT SEEDLINGS

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Formalin was applied to wheat seed at concentrations of 1/320, 1/240, and 1/160. All treatments were deleterious to both germination and growth of treated seed, and these effects were accentuated in a dry soil. Injury varied directly with the temperature of the treated grain during the 24-hour period intervening between treatment and planting.

RECOVERY IN WHEAT FOLLOWING INITIAL STUNTING CAUSED BY HELMINTHOSPORIUM SATIVUM

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In an earlier paper it was reported that wheat plants, which were stunted following inoculation of the seed with *H. sativum* before sowing, showed a marked tendency to recover, as indicated by the transpiration rate of the diseased plants compared with that of the controls. This recovery was evident also in the yield of grain.

In studying further this recovery under field conditions and in the greenhouse, the course of the disease and of recovery was followed by comparing areas of the successively formed leaves of the main culm. In a number of tests, stunting of the plants caused by *H. sativum* was indicated by leaf areas in the first three leaves being about 60 to 70 per cent of the areas of corresponding leaves in the controls. Similarly, recovery was indicated by the 4th, 5th, and 6th leaves (and others where they occurred) tending to equal in area or exceed the corresponding leaves of the control plants. In some experiments the excess of leaf area in the inoculated plants was sufficient to produce a statistically significant larger yield than occurred in the controls. For this to occur, the conditions for growth must be good. Any drought, weediness, or, in the greenhouse, poor light conditions, tended to prevent recovery.

Similar tendencies to recover were found when reductions in size of leaves were brought about in the seedlings by inoculation of the soil with *Pythium arrhenomanes* (browning root rot disease), by clipping off portions of the first three leaves of each seedling, and by treatment of the seed with formalin solution before planting. When any form of injury was avoided by using small seed *vs.* normal seed to obtain small seedlings, they tended to recover as to size of the later formed leaves just as in the case of the injured seedlings, whether injury was caused by parasites, by mechanical, or by chemical means.

If, as seems probable from these studies, wheat plants which become diseased and stunted due to infection by *Helminthosporium sativum* tend to recover under favourable conditions of moisture and competition, it appears important to give consideration to such tendency to recover when making estimates of losses due to *H. sativum*.

THE EFFECT OF PASMO ON THE YIELD OF FLAX

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Pasmo, now recognized as one of the worst diseases of flax, was first described in the Argentine in 1911. It was identified definitely in North Dakota in 1920, and at Ottawa in Canada in 1939. The disease has been found regularly in Manitoba since 1942 and extended into Saskatchewan in 1946. The leaves, stems, and fruiting structures of flax plants in patches in the field may show the brown lesions caused by the pathogen, *Septoria linicola* (Speg.) Garassini. The characteristic symptom of the disease is an alternate banding of green and brown areas along the stem, produced by the coalescence of the elongate brown lesions.

Infections of pasmo varying in severity were induced in field plots of Viking, Redwing, Royal, and Crystal flax at Morden and Winnipeg in 1945 and 1946. The foregoing varieties are named in decreasing order of susceptibility, but even Crystal was heavily infected. Yields of all four varieties were greatly reduced by heavy infection. Highly significant negative correlations were found between the yield and the amount of disease recorded in both years. In Viking, Redwing, and Royal the reduction in yield was caused largely by the smaller size of individual seeds, as indicated by highly significant correlations between yields and 1000-kernel weights. Other factors apparently affected the yield of Crystal. Prediction equations were calculated, and by their use the effect of various percentages of pasmo in reducing yields was determined. The calculated values agreed closely with experimental data for all varieties but Crystal.

None of the 130 varieties tested in 1946 possessed any real resistance to pasmo.

DITYLENCHUS RADICICOLA, A NEMATODE PARASITIC ON THE ROOTS OF WHEAT AND OTHER GRAMINACEOUS HOSTS

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The nematode *Ditylenchus radicicola* (Grieff) Filipjev, which produces galls on the roots of wheat and other graminaceous hosts, has been found in a field north of Radisson, Saskatchewan. It was first described in 1872 and has since been reported from several northern European countries. The present report appears to be the first outside of Europe. The field at Radisson is a low meadow which, according to local reports, was formerly more or less continuously under water, but in more recent years has remained dry. About fifteen acres were ploughed during the summer of 1946. The soil is high in organic matter and light in texture with slatey coloured, poorly textured cloddy areas low in organic matter. The roots of the native flora at the edge of the ploughed area were examined for galls; these were found on a species of grass which, on the basis of vegetative characters, appears to be *Agropyron Smithii. D. radicicola* was present in these galls. Various crop plants grown in five-inch pots containing the nematode-infested soil gave the following results: gall formation was heavy on wheat (var. Thatcher), moderate on barley (var. Plush) and *Agropyron cristatum,* and trace on rye (var. Prolific); no galls developed on oats (var. Exeter), *Bromus inermis,* corn, flax (var. Royal), sunflower (var. Mennonite), rape (var. Argentine), alfalfa (var. Grimm) and sweet clover (var. Redfield Yellow). Adequate control should be secured by proper crop rotation including a summerfallow.

THE POTATO ROT NEMATODE, DITYLENCHUS DESTRUCTOR, IN P.E.I.

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At the present time six farms in Prince Edward Island are known to be infested with potato rot nematode, *Ditylenchus destructor* Thorne. Infested farms and those adjacent have been quarantined and a survey of Prince Edward Island has failed to reveal additional areas.

The potato rot nematode displays very slow natural movement in the soil. Seed treatment with standard disinfectants has proven entirely ineffective in controlling the pest. No varietal resistance was found in the ten varieties of potatoes under test in 1946. Field mint, *Mentha arvensis,* has recently been shown to be a host. Numerous wild and cultivated plants have been critically examined, but no other hosts have yet been found.

Dow Fume W 10 soil fumigant proved highly effective in controlling rot due to the potato rot nematode. Tubers from plots treated with this chemical graded 99.2 per cent healthy in April, 1947. At this time checks had become severely affected and graded 55.6 per cent healthy. Other fumigants were only partially effective and cannot be regarded as highly efficient under the conditions of our test.

Higher percentages of rot were recorded from plots treated with acid fertilizer chemicals than from checks and those treated with neutral forms. Very few data have been secured regarding dates and periods of infection. Results show that considerable infection took place in August, 1946. An intensive study has been made of various modes of symptom expression. Temperatures above those of normal storage are conducive to decay by the potato rot nematode and also favour decay by secondary organisms. Nematode rot develops in fairly pure culture at normal storage temperatures.

LOW TEMPERATURE BREAKDOWN OF POTATOES IN STORAGE

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A physiological disorder termed "low temperature breakdown" occurs when certain potato varieties are stored at temperatures just above the freezing point of the tissues. The internal symptoms are the development of discoloured blotches in the flesh of the tuber, varying from light reddish-brown to dark brown. Frequently a metallic, brownish-black colour appears in diffused patches on the skin as well.

The following varieties, listed in order of decreasing susceptibility, were tested: Katahdin, Chippewa, Irish Cobbler, Dooley, Green Mountain and Warba. The last two varieties are highly resistant to the disorder.

Tubers packed in moist sphagnum moss were injured less when stored at low temperatures than tubers not so protected. Tubers of susceptible varieties lost weight excessively at 32°F. Loss in weight in resistant varieties varied directly with temperature.

Periodic examinations of Katahdin and Green Mountain tubers stored at 32°, 36° and 39°F. were made throughout the winter. The point of onset of low temperature breakdown was thus established and the course of its development was followed. Observations were also made periodically of surface discoloration, surface moulds, flavour and refractometer readings for soluble solids. Cooking tests were performed on some of the samples as well. Affected tubers turned black during cooking or when allowed to stand after cooking. Low temperature breakdown in Katahdin tubers was associated with a high concentration of sugar. Green Mountain tubers showed even higher concentration, however, without showing symptoms of breakdown. Exposure to 32°F. for two months at the beginning of the storage period was more deleterious to Katahdin tubers than similar exposure at the end of the storage period.

Low temperature breakdown retarded or inhibited bud development in tubers of susceptible varieties. Such tubers germinated poorly when planted and produced weak plants with low yield.

A storage temperature of 36°F. is considered the best from all standpoints for the storage of potatoes, particularly if they are to be used for seed.

THE OCCURRENCE OF BACTERIA IN NORMAL POTATO PLANTS AND LEGUMES

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In many tests, made during several years, thin sections containing vascular elements, were aseptically cut from the stele of apparently healty potato stems and cultured on potato dextrose agar. Evidence obtained from these tests indicates that bacteria may inhabit the vascular area of the stems of normal potato plants. Similar evidence was also obtained with respect to the stele of tap roots of alfalfa and sweet clover, and the stems of garden beans.

WINTER CROWN ROT OR SNOW MOULD OF ALFALFA, CLOVERS, AND GRASSES IN ALBERTA

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Winter crown rot or snow mould, caused by an unidentified low-temperature basidiomycete, is widespread in the central and northern areas of Alberta and Saskatchewan. Severe damage often occurs in alfalfa, alsike, and white Dutch clover, and in timothy, red top, and creeping red fescue. The disease is less prevalent in red clover, Kentucky bluegrass, and meadow fescue, and seldom occurs in brome, crested wheatgrass and slender wheatgrass. Iris and other garden perennials, as well as dandelion, quackgrass and various wild plants are also damaged.

The pathogen attacks the dormant plants beneath the snow during the first thaw in the late winter or early spring. The plants are killed or weakened in irregular patches as the result of rotting of the crown buds and tissues. The pathogen is difficult to isolate except from superficial mycelium or freshly infected tissues at a temperature near freezing.

The results of infection experiments in the field and under controlled conditions indicate that disease development is associated with physiological changes in the host. Inoculated alfalfa plants brought inside at weekly intervals became susceptible at dates varying from late November to late December in different seasons. Infection was most severe under the conditions provided by a slowly melting snow cover and was also influenced by soil temperature, soil moisture, and growth of the pathogen.

DISEASES OF FORAGE LEGUMES IN MANITOBA — THEIR PREVALENCE AND ECONOMIC IMPORTANCE

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The most prevalent disease in Manitoba affecting both alfalfa and sweet clover, the two important forage legumes of the province, is crown rot which results in heavy losses particularly in the alfalfa crop. Isolations and inoculation tests during the past several years indicate that, under conditions prevailing in Mantoba, a strain of *Rhizoctonia Solani* Kühn is the main, if not the sole, causal agent of this disease. The infected plants are readily invaded by saprophytic or weakly parasitic soil fungi which accelerate the disintegration of crown tissues, and the plants thus weakened are then killed by winter frosts.

Another very important disease is blossom drop of alfalfa. This disease is prevalent in alfalfa seed growing districts in Manitoba and often results in a complete failure of seed-set. The results of several tests indicate that blossom drop may be caused by a species of *Alternaria.*

Leaf and stem spots, such as Pseudopeziza leaf spot of alfalfa, black stem of sweet clover and alfalfa, etc., are prevalent throughout the province but only occasionally appear with sufficient intensity to cause material damage.

A STRAIN OF BACILLUS SUBTILIS POSSESSING DISTINCTIVE ANTIBIOTIC PROPERTIES TOWARDS XANTHOMONAS TRANSLUCENS AND OTHER BACTERIA

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A rough strain of *B. subtilis* isolated from Edmonton soil and designated as strain A 32 in our culture collection was found to be relatively non-phytotoxic and to show marked antagonism towards certain other bacteria and especially towards the graminicolous pathogen *Xanthomonas translucens.* Liquid media in which A 32 had grown, when extracted with n-butyl alcohol, yielded a fraction active against a number of bacteria including several other phytopathogens.

The active fraction from A 32 differs in several respects from subtilin, an antibiotic previously isolated from *B. subtilis* by Jansen and Hirschmann. Also A 32 itself can be distinguished from the subtilin-producing strain of *B. subtilis.*

The active substance produced by A 32 is excreted into the culture fluid and is not found in the cellular debris as is subtilin. It is not satisfactorily extracted by means of the method used in isolating subtilin. On the other hand, the n-butyl alcohol technique used for A 32 has failed to yield a potent extract from cultures of a subtilin-producing strain of *B. subtilis,* namely strain 231 of N. R. Smith.

The A 32 strain sporulates more readily, is much less adherent to an agar slant, grows on media of much lower asparagine content and does not give a blue colour reaction with $FeCl_3$ as does the subtilin strain.

Using a paper-disc agar-plate method of essay, all form species of *Xanthomonas translucens* tested were found to be sharply inhibited by the n-butyl alcohol extract from A 32. *Pseudomonas coronafaciens, Erwinia carotovora, Agrobacterium tumefaciens, Aerobacillus polymyxa, Sarcina lutea, Bacillus megatherium* and *B. mesentericus* were also susceptible as were several other named and unnamed strains of bacteria. Some of the above organisms also proved susceptible to subtilin (a 1:1000 dilution), though the inhibition zones produced by it were much smaller than those produced by the extract from A 32. A few species of bacteria such as *E. carotovora* and *A. tumefaciens,* while susceptible to the extract from A 32, proved resistant to subtilin, under the methods of testing used.

LITTLE CHERRY — A VIRUS DISEASE

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Little cherry was noticed first in 1933 in a single orchard near Nelson, B.C. It has spread since then into all the cherry-growing districts of the Canadian Kootenays, and recently into several districts in the State of Washington. The symptoms are displayed only in the fruits, giving a reduction in size, colour and flavour. Proof of the virus nature of the trouble was provided by W. R. Foster and T. B. Lott, by transfer of buds from diseased trees to healthy orchards. Experiments are now in progress designed to demonstrate the agents of spread and the host range of the virus. Attempts are being made to identify varieties of sweet cherry resistant to little cherry. There appears to be a complex of virus diseases in stone fruits on the Pacific Coast, including little cherry, albino cherry, buckskin of cherry, cherry wilt and decline, and western-X of peach and choke-cherry.